TITLE SIX - Sewers

CHAPTER 1060
Construction of Sewers Generally

EDITOR'S NOTE: Unless otherwise indicated, this chapter was enacted on March 18, 1969, and amended on May 5, 1970.

CROSS REFERENCES

Sewage disposal generally - see Code of Va. ''15.2-2122 et seq.
Department of Building and Development - see ADM. Ch. 240
Sanitation Authority - see ADM. Ch. 260
Construction of building sewers - see S.U. & P.S. 1064.10 et seq.
Pretreatment of wastewater - see S.U. & P.S. Ch. 1068
Sewerage facilities in subdivisions - see P. & Z. 1245.08

1060.01 PERMIT REQUIRED; PLANS.

No new sewerage system to serve or to be capable of serving three or more connections shall be established, and no extension of a previously approved sewerage system shall be made, until a detailed plan of such proposed new system or of such proposed extension, with proof of capacity to serve, has been filed with, and a permit therefor has been obtained from, the Board of Supervisors.

1060.02 APPLICATION FOR PERMIT.

Application for a new system or for an extension, as described in Section 1060.01, shall be made in writing; shall state in detail the number, nature and location of connections to be served (including dwelling units, schools and other public buildings,

and commercial and industrial establishments, together with the probable number of employees of each such establishment); shall be accompanied by scale drawings showing the location, size, material and extent of the proposed sewerage system, including appurtenances, together with such other pertinent information as the Board of Supervisors or its duly authorized representative may require; and shall show in sufficient detail the manner in which the applicant proposes to meet the standards set forth in Section 1060.04 et seq.

1060.03 COMPLIANCE WITH STANDARDS.

No application shall be approved by the Board of Supervisors and no permit shall be issued for the establishment of any new sewerage system or for the extension of any existing sewerage system, and no work shall be done in connection with any such new system or such extension, except in accordance with the following standards and such other reasonable standards as may be applicable to the particular application.

1060.04 GENERAL DESIGN STANDARDS.

(a) Tributary Population.

(1) Sewerage systems which provide for a complete watershed shall be designed and sized taking into consideration the estimated tributary population for a period of fifty years hence. The entire watershed shall be assumed to be completely built-up according to present or predicted zoning ordinances, whichever requires the greater capacity.

(2) Sewerage systems which provide for only a part of a complete watershed shall be sized to provide for the entire watershed. Otherwise, provision shall be made for future increased capacity. Proper modification to allow for the characteristics (i.e. domestic, commercial and industrial wastes and ground water infiltration) of the area under consideration shall be made.

(3) Trunk and subtrunk sewers shall be designed on a basis of population density of not less than ten persons per acre. Design provisions in excess of this minimum shall be made where the engineer deems it necessary. Supporting data shall be included in the design analysis. Design analyses shall be provided for all trunk and subtrunk sewers and, when required by the County, for collecting sewers.

(b) Capacities.

(1) In determining the required capacities of sanitary sewers, the following factors shall be considered:

A. The maximum hourly quantity of domestic sewage;

B. Additional maximum sewage or waste from industrial plants and commercial areas; and

C. Ground water infiltration.

(2) New sewerage systems shall be designed on the basis of an average per capita flow of sewage from the equivalent population served of not less than 100 gallons per day. On this basis, lateral and submain sewers shall be designed with capacities, when running full, in accordance with the peak flows indicated in Figure 1, entitled "Design Flow for Sewers When

Average Flow: 100 Gal./Cap./Day," following this chapter.

(3) The 100 gallons per capita per day figure is assumed to cover normal infiltration, but an additional allowance shall be made where conditions are especially unfavorable. This figure is likewise considered sufficient to cover the flow from cellar floor drains, but is not sufficient to provide an allowance for flow from foundation drains, roof leaders or unpolluted cooling water, which are prohibited by law from discharging into sanitary sewerage systems. See Chapter 1064.

(4) Unless evidence is presented to prove a different flow from industry at ultimate development, the minimum allowance for industrial flow shall be determined by providing an equivalent population of forty persons per acre or one equivalent population per employee, whichever is greater, in the industrial area. The area includes the entire area zoned for industry, except public road, street and highway rights of way, flood plains on which construction is prohibited and "green zones" separating industrial from residential areas, on which construction is prohibited.

(5) The minimum allowance for flows from commercial areas shall be determined by providing an equivalent population of thirty persons per acre, or one-half the equivalent population per employee, whichever is greater, in the commercial area. The area includes the entire area zoned for commercial development, including off-street parking areas and landscaped areas, but excludes the rights of way of public roads, streets and highways, flood plains of streams on which construction is prohibited and "green zones," 100 feet or more in width, separating commercial from residential areas, on which construction is prohibited.

(6) In cases where the above criteria are not applicable, an alternate design procedure may be submitted to the County for approval. A description of the procedure used and justification for the modifications for the proposed sewer design shall be included with the design analyses and plans submitted for approval.

(c) Sewer Locations. In general, sewers shall be located on legally established streets or rights of way and shall be equidistant from property lines or curb lines wherever possible. The horizontal distance between sewers and existing or projected water mains shall be not less than ten feet, except where the water mains are located at a higher elevation (a minimum of one and one-half feet above the top of the sewer) than the top of the sewer, in which case a minimum horizontal distance of six feet will be permissible.

(d) Manholes.

(1) Manholes for access to sewers shall be provided at all intersections with other sewers, at all points of change in alignment, at all changes in grade and at the terminal of the line. In addition, access manholes shall be provided at intervals not exceeding 400 feet on all sewers fifteen inches in diameter or less and not more than 500 feet apart on sewers eighteen inches in diameter or larger.

(2) Sewer manholes for sewers up to twenty-four inches in diameter shall be not less than four feet in inside diameter. Manholes for sewers larger than twenty-four inches and up to forty-eight inches shall have an inside diameter of not less than five feet.

(3) Manholes shall have eight-inch walls constructed of brick or block and shall be parged inside and outside with one-half inch cement mortar or shall be of precast concrete construction equivalent to or greater than that specified in A.S.T.M. C 478, the latest revision, and having gasket material in accordance with specification A.S.T.M. 361, the latest revision.

(4) Manhole frames and covers shall be gray cast iron and shall be designed for roadway traffic. The word "sewer" shall be cast in the cover.

(5) Manhole bases shall be of Class A reinforced concrete and shall be a minimum of nine inches thick.

(e) Minimum Sewer Size. No public sewer shall be less than eight inches in diameter.

(f) Sewer Connections. Connections to sewer lines eighteen inches in diameter or larger shall be made only at manholes.

(g) Hydraulic Design Criteria. The hydraulic design and determination of sewer sizes shall be based on the following conditions:

(1) Sewers shall have a uniform slope and straight alignment between manholes.

(2) At all junctions where a sewer of smaller diameter discharges into a larger one and at all locations where the sewer increases in size, the invert of the larger sewer shall be lowered so that the energy gradient of the sewer at the junction is at the same level. Generally, this condition will be met by placing the crowns of the two sewers at the same elevation.

(3) Sewers shall be designed to be free flowing with the hydraulic grade below the crown and with hydraulic slopes sufficient to provide an average velocity, when running full, of not less than 2.25 feet per second (f.p.s.). Computations of velocity of flow shall be based on the following values of "n," as used in the Kutter or Manning formula for velocity of flow. For pipe sizes eight to twenty-four inches in diameter, laid in lengths up to five feet, "n" equals 0.013. For pipe sizes eight to twenty-seven inches in diameter, laid in lengths of six feet or longer, "n" equals 0.012. For pipe sizes thirty inches in diameter and up, laid in lengths of four feet or more with tongue and groove-type joints carefully made smooth, "n" equals 0.012.

(4) For sewage flow depth less than one-fourth full, allowance shall be made for increased value of "n" and in no case shall velocities of less than 1.3 f.p.s. be permitted. The improved velocities shall be accomplished by steeper grades and not by increasing the pipe diameter.

(5) The maximum permissible velocity at average flow (before applying the peak flow factor) shall be fifteen f.p.s. Suitable drop manholes shall be provided to break the steep slopes in order to limit the velocities in the connecting sewer pipes between manholes. Where drop manholes are impractical for the reduction of velocity, the sewer shall be of cast iron or other abrasion-resistant material.

(h) Structural Design. The structural design of sewers shall conform with the methods given in the A.S.C.E. Manual No. 37 for the "Design and Construction of Sanitary and Storm Sewers." Sewers installed in streets shall generally have a minimum cover of six feet.

(i) Pipe Materials. The County reserves the right to select the type of material used in sewer installation from the following list of materials:

(1) Asbestos cement pipe. Asbestos cement sewer pipe shall be in conformity with A.S.T.M. Designation C428, the latest revision, and must also be autoclave cured in a manner to eliminate all free lime.

(2) Clay pipe. Vitrified clay pipe shall be in conformity with A.S.T.M. Designation C13, the latest revision, for standard strength clay sewer pipe, or A.S.T.M. Designation C200, the latest revision, for extra strength clay sewer pipe. All joints shall conform to A.S.T.M. Designation C425, the latest revision.

(3) Reinforced concrete pipe. Reinforced concrete sewer pipe shall be in conformity with A.S.T.M. Designation C76, the latest revision, for Class II, Class III, Class IV or Class V with the exception that absorption shall be limited to five percent. All joints shall be of the "O" ring type.

(4) Cast iron pipe. Cast iron pipe used for sewer installation shall be in conformity with American Standard Specifications for Cast Iron Pipe for Water (A.S.A. A-21.2, A-21.6 and A-21.8). Wall thickness shall be computed according to A.W.W.A. Manual C101. No cast iron soil pipe shall be used as a public sewer, but such pipe may be used for building sewers as required by Chapter 1064. (Adopting Ordinance)

1060.05 CONSTRUCTION REQUIREMENTS.

(a) Excavations.

(1) Generally. During the excavation operations, material suitable for backfilling shall be piled in an orderly manner at a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated material not suitable and/or required for backfill shall be removed and disposed of in an approved manner. Such grading shall be done as may be necessary to prevent water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by approved methods. All excavations shall be made by open cut unless otherwise specified.

(2) Trench excavations. The trench shall not be opened for a distance exceeding 300 feet at any time when located along streets or highways. The width of the trench at any point below the top of the pipe shall not exceed the structural design assumption width. The width of the trench above the top of the pipe may be as wide as necessary for sheeting and bracing and the proper performance of the work. All trench walls shall be kept as nearly vertical as possible. Excavation at manholes and similar structures shall be sufficient to leave at least twelve inches clear between their outer surface and the embankment or sheeting. Minimum clearance between the sides of the trench and pipe shall be eight inches.

(3) Rock excavations. In rock, the minimum width of the trench shall be the outside diameter of the pipe plus twelve inches, and there shall be a minimum of six inches of sidewall clearance between the pipe and rock at all points. The maximum width of the trench at any point below the top of the pipe shall not exceed the structural design assumption width. The rock shall be excavated to a minimum overdepth of ten

inches, or as required for class of bedding, whichever is greater, below the outside bottom of the pipe. Before laying pipe in rock trenches, the trench shall be refilled with suitable material of an approved quality, thoroughly consolidated, up to the proper elevation to provide a foundation as required in subsection (b) hereof for laying the pipe.

(b) Pipe Foundations.

(1) Pipe installed in trenches. Pipe to be located at elevations below the existing ground level shall be installed in trenches with Class A, B or C pipe bedding as shown in Figure II following this chapter. Granular material under and around the pipe shall be placed in six-inch layers and compacted by rodding, spading or with approved vibratory equipment to obtain not less than eighty percent relative density as determined by A.S.T.M. Method D2049.

(2) Pipe installed in embankment. Pipe to be located at elevations above the existing ground level shall be installed in trenches excavated after embankment has been constructed to a minimum elevation of one foot above the proposed top of the pipe.

(3) Pipe bedding material. The pipe shall be bedded from the trench subgrade to the pipe springline in granular material consisting of gravel, crushed gravel or crushed stone meeting the requirements of A. S. T. M. Designation C33, Gradation 67 (three-quarter inch to No. 4).

(4) Foundation in poor soil. Whenever the soil at the bottom of the trench is soft, unstable or saturated with water, a granular fill shall be provided under the pipe to a depth required to stabilize the soil. The maximum size of gravel shall be two inches. A concrete cradle shall be provided when necessary to bridge highly unstable soils.

(c) Backfill.

(1) Material. All material used for backfilling of trenches shall be free of excessive amounts of deleterious materials such as all organic matter, frozen clods and sticky masses of clay and gumbo which are difficult to properly compact. No rock material used for backfill shall be longer than four inches in its greatest dimension or be placed within twelve inches of the installed pipe in any direction, including under, around and on top of the pipe. The pipe shall be embedded in a good quality earth or granular material such as crushed rock or pea gravel.

(2) Height of layers. Backfill shall be placed in six-inch layers from the bottom of the trench to a point at least twelve inches above the top of the pipe and thoroughly tamped by hand or pneumatic tampers. Above this point, backfill shall be deposited in layers of a thickness which will permit compaction to a density specified in paragraph (c)(3) hereof.

(3) Compaction of layers. The layers of material shall be compacted to a density of at least ninety-five percent of the maximum density at optimum moisture content as determined by the AASHO Standard Test (AASHO Designation T99) under all pavements and for future pavements. Pavement shall not be restored over trenches until the backfill material has been tested and determined to be satisfactory according to the tests.

(d) Safety of Public.

(1) Maintenance of traffic. Construction operations shall be scheduled so as to interfere as little as possible with public travel, whether vehicular or pedestrian. Whenever it is necessary to cross or interfere with roads, driveways and walks, whether public or private, suitable and safe bridges, detours or other temporary expedients for the accommodation of public and private travel shall be provided and maintained. Reasonable notice shall be given to owners of private drives before interfering with them.

(2) Barricades and lights.

A. All streets, roads, highways and other public thoroughfares which are closed to traffic, under the authority of a proper permit, shall be protected by means of effective barricades on which shall be placed acceptable warning signs. Such barricades shall be located at the nearest intersecting public highway or street on each side of the blocked section of such public thoroughfare.

B. All open trenches and other excavations shall be provided with suitable barriers, signs and lights to the extent that adequate protection is provided to the public against accident by reason of such open construction. Obstructions, such as material piles and equipment, shall be provided with similar warning signs and lights.

C. All barricades and obstructions shall be illuminated by means of acceptable warning lights at night, and all lights used for this purpose shall be kept burning from sunset to sunrise. Materials stored upon or alongside public streets, roads and highways shall be so placed, and the work at all times shall be so conducted, as to cause the minimum obstruction and inconvenience to the traveling public.

(e) Sheeting and Bracing. All trenches and excavations shall be properly sheeted and braced for the safety of personnel and the protection of the work, to maintain the maximum trench widths permitted and/or to prevent the disturbance or settlement of adjacent foundations or structures.

(f) Construction on State Highways and Streets. The State Department of Highways and Transportation requires a permit for work to be performed on State highways. Provisions for obtaining such permits are set forth in the "Manual on Permits, Virginia Department of Highways, Richmond, Virginia," the latest revision. No work shall be approved by the County that has not been accepted or approved as satisfactory by the State Department of Highways.

(g) Restoration.

(1) The County shall not approve any construction wherein public or private property has not been restored to a condition at least equal to its condition before commencement of construction.

(2) All streets, roads and highways shall be restored as required by the State Department of Highways and Transportation.

(3) Work performed on private property shall be confined to the easements obtained, and the area shall be seeded or sodded, the landscaping restored, fences restored and all damaged improvements replaced or restored.

(h) Acceptance Tests.
(1) The County shall be permitted access to the construction work at any time for inspection of the work and construction methods.
(2) Sewers shall be checked by the County to determine whether any displacement of pipe has occurred. The test shall be as follows: A light shall be flashed between manholes by means of a flashlight or reflection of sunlight with a mirror. If the illuminated interior of the pipe shows poor alignment, displaced pipe or any other defect, the defect shall be remedied.
(3) All completed sewers shall be tested for leakage by exfiltration (i.e. outward leakage, trench dry) or infiltration (i.e. inward leakage, trench wet). Leakage shall not exceed 200 gallons per inch of diameter of sewer per mile per day up to a twenty-four inch diameter. Leakage may be allowed up to 400 gallons per inch of diameter per mile per day for short sections of sewer lines (between two adjacent manholes) up to and including a twelve-inch diameter. However, the average leakage on the system being tested for acceptance shall not exceed the 200-inch gallon standard.
(4) For sewers larger than twenty-four inches in diameter, leakage shall not exceed 5,000 gallons per mile per day.

(i) Blasting. Blasting, where required, shall be done with care in accordance with all applicable Federal, State and local laws, ordinances and regulations, and shall not be done within a distance of twenty-five feet from a previously laid pipeline or a previously installed structure if, in the opinion of the County, the safety or soundness of existing facilities is in any manner endangered.

(j) Protection of Existing Facilities. All construction operations in the vicinity of existing facilities shall be performed with care to prevent damage to these facilities. If damage occurs, repairs shall be made in a manner approved by the County and any damaged facility shall be repaired with new materials and restored to its original condition. (Adopting Ordinance)

1060.06 APPLICATIONS.
(a) In General. Applications for an installation shall be made in writing and submitted in duplicate in accordance with the following instructions:
(1) The application shall state the location and size of the area to be served; shall state in detail the number, nature and location of connections to be served (including dwelling units, schools and other public buildings, and commercial and industrial establishments, together with the probable number of employees of each such establishment); and shall be accompanied by two copies of a preliminary plat (measuring twenty-three inches by thirty-six inches) drawn to scale and showing the following information:
A. The upper half of the drawing shall show the sewer location in the plan and the lower half shall show the profile of the sewer and of

the ground surface.

B. All manholes shall be located in the plan and on the profile.
C. In addition to the sewers, the plan shall show the location of existing structures, houses, etc., plus the location of proposed or existing underground utilities, curbs, property lines, railroad crossings, culverts, bridges, etc., crossing the sewer line.
D. The horizontal scale for profiles shall be the same as that used for the plan, which shall in no case be smaller than 100 feet to the inch. The vertical scale shall in no case be smaller than ten feet to the inch.
E. Sewer sizes, manhole numbers and stationing shall be shown on the plan and repeated on the profile.
F. Sewer grades, invert elevations at manholes, elevations of the tops of manhole castings, types of pipe, locations of cradles, etc., maximum levels or flood stages at manholes and existing and proposed street grades shall be shown on the profile.
G. A vicinity map at a scale not smaller than 4,000 feet to the inch shall be used as a cover sheet for all plans where the proposed installation is on more than one street.
H. The following note shall be placed on the cover sheet for all plans: "Sanitary sewers shall be constructed in strict compliance with current standards of Loudoun County."

(2) The application shall include such other pertinent information as the County may require and shall indicate in full detail the manner in which the applicant proposes to meet the standards set forth herein. The plat shall be prepared and certified by an engineer duly authorized by the State to perform such work. The application shall be accompanied by a certificate from the County Zoning Administrator that the area to be served by the proposed installation has been officially zoned for the particular type of land use described in the application and shown on the accompanying plat.

(b) Review of Application. In making its review of the application and accompanying preliminary plat, the County reserves the right to require such changes, including changes in pipe sizes, as it may consider necessary in order to meet the requirements of these standards and to permit future extensions where circumstances so indicate.

(c) Issuance of Permit. Upon delivery of the application to the County by the applicant, as hereinbefore provided, the County may issue the official permit for the installation of the project. The applicant is hereby placed on notice that any installation work he may do on the project prior to the issuance of such permit is done entirely at his own risk.

(d) Notice of Construction. The holder of a permit hereunder shall notify the County Administrator of the actual installation of any sewer or other facility covered by such permit at least forty-eight hours prior to the covering up of such sewer or facility in order to permit inspection and testing thereof.

1060.07 LIMITATIONS OF CHAPTER.

Nothing in this chapter or in the issuance of a permit under this chapter shall permit the installation or extension of any sewerage system in violation of any of the provisions of the County Subdivision Regulations or without first obtaining from the County Planning Commission the approval required by Section 15.2-2232 of the Code of Virginia of 1950, as amended.
(Ord. 98-01. Passed 3-18-98.)

1060.08 PROHIBITION OF USE PRIOR TO APPROVAL.

None of the facilities constituting any part of a sewerage system shall be used, in whole or in part, unless and until the Director of the Department of Building and Development has given his unconditional written approval of all facilities comprising such system. (Ord. 91-23. Passed 9-17-91.)

1060.99 PENALTY.

(EDITOR'S NOTE: **See Section 202.99 for general Code penalty if no specific penalty is provided.)**

LOUDOUN COUNTY VIRGINIA

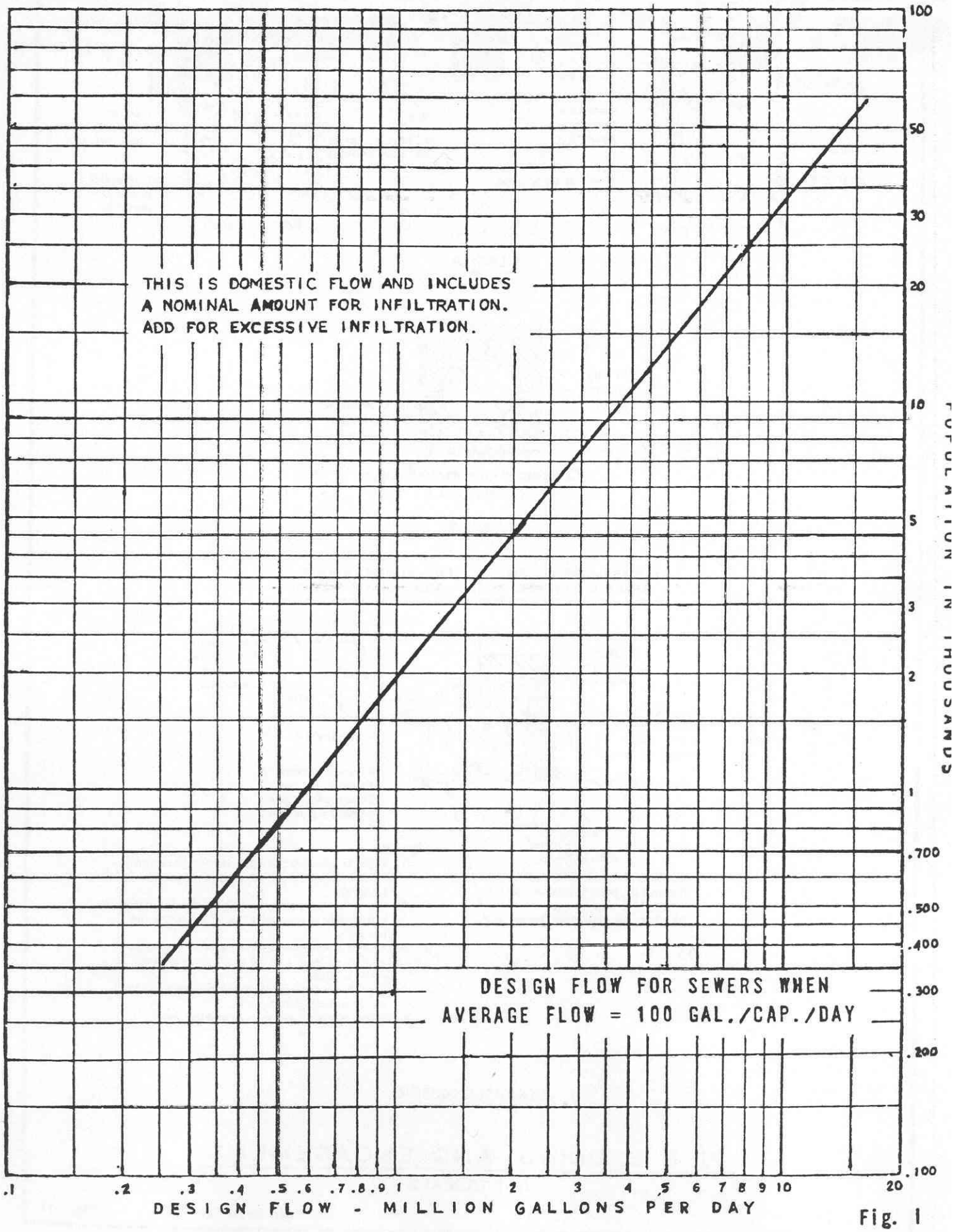
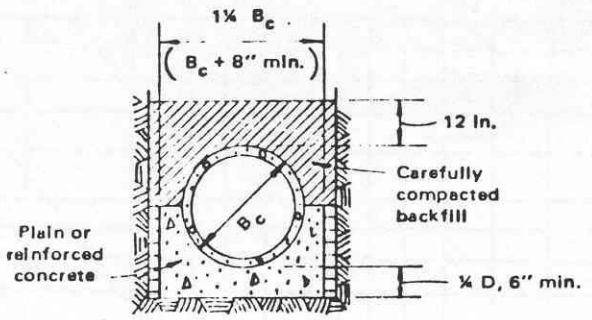
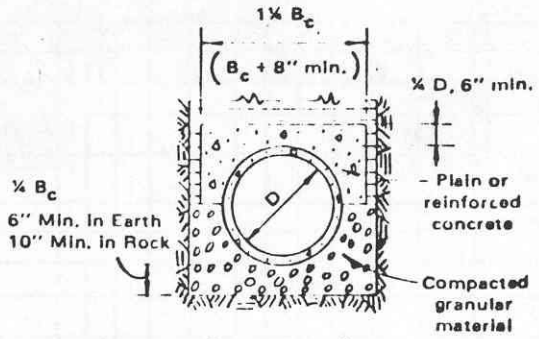


Fig. 1

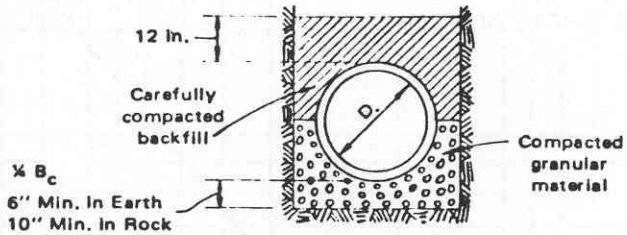


Concrete cradle



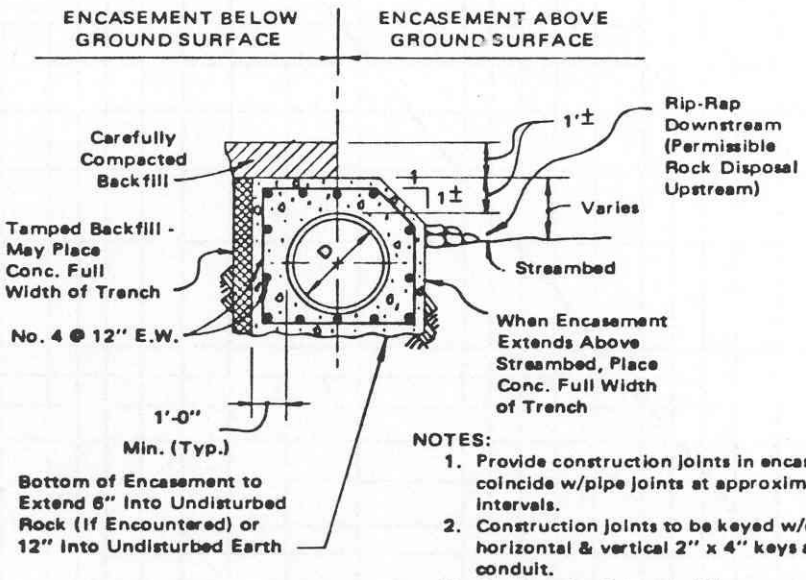
Concrete arch

CLASS A



Compacted granular bedding, load factor 1.9

CLASS B



NOTES:

1. Provide construction joints in encasement to coincide w/pipe joints at approximately 32' intervals.
2. Construction joints to be keyed w/continuous horizontal & vertical 2" x 4" keys around conduit.
3. Construction joints shall have a separation area of at least 75% of total encasement cross section.
4. Discontinue longitudinal reinforcement at construction joints.
5. Begin & End Encasement at Pipe Joint.

STREAM CROSSING

PIPE BEDDING AND ENCASEMENT

NOT TO SCALE

Revised: December 1975

Fig. II